3.10 Clinical Laboratory Ovens

3.10.1 Use and Principles of Operation

Ovens in laboratories are used to dry samples and for evaporating, dehydrating or sterilizing. On a limited basis some are used as a dry incubator. In many cases, precise temperature control is required.

Clinical ovens may be bench, cabinet, or walk-in size. However, bench top are the most common in the developing world. All ovens will include a heat source, a well insulated container (usually including a door with tight sealing gaskets), and a thermostat/thermometer. More advanced ovens may include timers/alarms, fans to circulate air inside the oven to achieve uniform heating, shelving units or racks, humidity control options, or air filtration. The heating mechanism may be electric, natural gas, propane, oil, radiofrequency or microwave, but the electric heater is the most common in the developing world.

Operation is simple. Place the sample in the oven (or empty it if you are testing it). Shut the door. Set the desired temperature. The oven may have a timing feature or timing may have to be completed manually. After the heating cycle, allow the oven to cool before opening it.

If the oven is being used for sterilization, the following table should be used. Sterilization timing should not begin until the oven has reached the required temperature.

Temperature (C °)	Time (min)
160	180
170	120
180	30

3.10.2 Common Problems

The power supply and heating element are the most likely sources of problems. The electrical heating element is of a typical construction and material and can probably be replaced in the developing world, as long as the resistance and max power (nichrome wire) are matched.

If the oven is not reaching the desired temperature, you should suspect the door gasket, fan or sensing device. If the door gasket does not seal air tight, try cleaning the seal with soap and water. Rinse well before testing again. It may be possible to find a material to seal an oven door in the developing world, if the seal must be replaced.

If there is a fan, and it is not turning, and the problem is not the power supply, the fan motor can be replaced with any motor of a similar size (see the centrifuge and motor chapter for more suggestions).

The temperature sensing device may be part of the temperature feedback mechanism. An exact match is often necessary. You may be able to defeat the temperature sensor with a short circuit or open circuit, leaving the oven in the on position at all times. The user would be required to carefully monitor the temperature. Install a switch in the main power line so that they can cycle the heater as needed. This is clearly not an ideal solution, but is better than having no oven at all.

If the oven is reaching the desired temperature and holding that temperature, then the device is working. In some cases, the user may complain about highly non-uniform heating. In many cases, this will be caused by a broken fan. In this case, attempt to measure the temperature in several parts of the chamber. Discuss the degree of uniformity required to satisfy the user's needs. In the developing world, they may have to survive with little uniformity, but at least a functioning oven.

Temperature accuracy varies tremendously with the oven's application. Larger error can be acceptable if the oven is used for drying glass, but accuracy may be crucial if biological fluids are being warmed in the oven. The same is true with the fan. An operating fan may not be critical depending on the oven's use. Discuss these issues with the user before returning the oven.